

Appl. No. 09/807,457  
Amdt. dated October 29, 2004  
Reply to Office Action of July 14, 2004

### REMARKS/ARGUMENT

This amendment responds to the Office Action of July 14, 2004.

Claims 1-13, 16-18, 22, 25-30, 33-38, and 40-51 are pending in the application with claims 14, 15, 19 - 21, 23, 24, 31, 32, and 39 having been canceled, and claims 1, 8, 22, 25-28, 35, 36, 44, and 51 having been amended.

Claims 1-13, 16-18, 20, 22, 25-30, 32-38, and 40-51 have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. According to the Examiner, "Given that the terms, 'flexible' and 'structurally rigid', are subjective terminology and that the terms are not mutually exclusive since rigid structures may be flexible, it is unclear what degree of cure or reaction of the double bonds is denoted by step (c) of claims 1, 20, and 51."

Claim 20 has been canceled. Parts (c) of claims 1 and 51 have been amended by deletion of the phrases "curing the resulting flexible preform to a structurally rigid moulded body" and "resulting flexible preform to a structurally rigid moulded body", respectively.

Accordingly, it is requested that the rejection of claims 1-13, 16-18, 20, 22, 25-30, 32-38, and 40-51 under 35 U.S.C. 112, second paragraph, be withdrawn.

Claims 1-13, 16-18, 20, 22, 25-30, 32-38, and 40-51 have been rejected under 35 U.S.C. 112, first paragraph, because, according to the Examiner: "... the specification, while being enabling for compositions derived from an isocyanate reactant and an unsaturated hydroxyl reactant, wherein one of the reactants is at least trifunctional with respect to either the isocyanate

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group or the hydroxyl group and the other reactant is at least polyfunctional (difunctional) with respect to the corresponding reactive group, does not reasonably provide enablement for compositions derived from only an isocyanate reactant or an unsaturated hydroxyl reactant that is at least trifunctional. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims. As claimed, applicant's claim limitation that at least one of the starting components is at least trifunctional fails to set forth the relationship between the reactants that will yield the required crosslinked structure. The "trifunctional" limitation fails to require that the trifunctionality be with respect to either isocyanate or hydroxyl groups. ... Furthermore, applicant's claims fail to set forth the requirement that the non-trifunctional reactant must be at least difunctional. In order for a crosslinked structure to result, it is insufficient to require only one reactant to be polyfunctional."

The sections (a) of claims 1 and 51 have been amended to that at least one of the starting components is at least trifunctional and the other one is at least difunctional, with regard to NCO or OH groups, respectively.

Accordingly, it is requested that the rejection of claims 1-13, 16-18, 20, 22, 25-30, 32-38, and 40-51 under 35 U.S.C. 112, first paragraph, be withdrawn.

Claims 8, 9, and 42-45 have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. According to the Examiner: "Claim 8 requires that the two or

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more performs be brought into mutual contact; however, claim 9 states that a fiber material is inserted between the preforms. It is unclear if 'mutual contact' requires that the performs *[sic]* be next to each other; if so, then claim 9 is not properly further limiting, since the fiber material will preclude the 'mutual contact' of the performs *[sic]*."

Claim 8 has been amended by deletion of the phrase "which are brought in mutual contact." Accordingly, it is requested that the rejection of claims 8, 9, and 42-45 under 35 U.S.C. 112, second paragraph, be withdrawn.

Claim 32 has been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. According to the Examiner, "It is unclear what limitation is conveyed by 'flowable'."

Claim 32 has been canceled.

Claims 2, 22, and 25-30 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. According to the Examiner, "It is unclear why a dash appears after the dependent claim numeral."

No dash appears after the dependent claim numeral. What the Examiner refers to as a "dash" was, in fact, a "strike-out" intended to indicate the deletion of the comma that previously occupied that position.

Accordingly, it is requested that the rejection of claims 2, 22, and 25-30 under 35 U.S.C. 112, second paragraph, be withdrawn.

Claims 17 and 48-51 have been rejected under 35 U.S.C. 102(b) as being anticipated by EP 262488.

EP 262 488 has been cited and extensively discussed in the present specification. The essential difference between EP 262 488 and the present invention being the fact that the polyurethane material disclosed and claimed in EP 262 488, which is similar to the polyurethane material of the "preform" of the present invention, is used as a filler material in the production of shapeable and curable compositions for making dental devices.

More specifically, the '488 polyurethane-material is produced in the form of hard, solid lumps, consisting of polyurethane and silicon dioxide (approx. weight ratio 50:50; see examples 1 and 2), which lumps are ground and milled into powders and thereafter mixed with the organic, non-polyurethane-matrix material of the dental composition (see, e.g., examples 17 and 18). The mixture of organic matrix material and silylated polyurethane-filler material is then cured by radical triggered polymerisation, wherein the reactive double bonds shall react with the reactive groups of the organic matrix material in order to establish a strong connection between the matrix and the filler (see EP 262 488 p.2, lines 36-39 reading:

"It is the object of the invention to develop an organic filler which due to its high content of reactive groups that are co-polymerisable with the matrix monomers, establishes a strong connection between filler and matrix, and which after final

polymerisation yields a material that possesses substantially improved tensile strength, loading capacity and abrasion resistance."

That is, the '488 product is a dental composition formed from an organic, non-polyurethane matrix and a reactive, silylated polyurethane filler in powder form, wherein during final, radical-triggered polymerisation the silylated polyurethane filler reacts via its reactive double bonds with the organic matrix material and, optionally, also with a binder material added to the non-polyurethane matrix.

On the other hand, the moulded body of the present invention is a shaped and cured molded body having a polyurethane-matrix already in its preform, and optionally additives, wherein during final, radical-triggered polymerisation, the reactive double bonds of the polyurethane matrix react with each other, thus stabilizing and curing the shaped structure of the polyurethane matrix preform.

Moreover, the inventors of EP 262 488 did not realize that the polyurethane-filler material would have had flexible, optionally even elastic, properties when manufactured without addition of silicon dioxide. Such properties were neither anticipated nor sought as the sole intended use of the material was as a filler material in comminuted, powdered form in the manufacture of improved curable dental compositions. Accordingly, there was no motivation for a person of ordinary skill in the art to:

- take the '488 polyurethane filler material out of its known context,
- in a non-powdered form,

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- to modify it by shaping steps, and
- to use it as a matrix rather than a filler material for non-dental applications.

Claims 1-13, 16-18, 20, 22, 25-30, 32-38, and 40-51 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Verleg et al. (U.S. Patent No. 5,286,832) or Smith (U.S. Patent No. 6,114,402), each in view of EP 262,488.

Verleg et al. disclose a process for the manufacture of cast, injection moulded or compression moulded articles by curing a resin composition in a desired shape using catalysts, and allowing the shaped piece to post-cure under such conditions that an HDT of at least 150° C is obtained. The resin composition comprises a polyisocyanate, an ethylenically unsaturated monomer and a vinyl ester compound, and the vinyl ester compound contains on average about two to about six (meth)acrylate groups and on average about two to about six hydroxyl groups, and has a molecular weight higher than 300.

Smith discloses a polyurethane composition that provides a rigid polyurethane foam suitable for use as a core material in a composite laminate and which polyurethane composition includes an additive compound or oligomer-prepolymer having hydroxy groups for reaction with the diisocyanate of the polyurethane or which has been prereacted with a diisocyanate and which contains after the polyurethane reaction ethylenically unsaturated groups, like allyl or acrylic groups, to react with an unsaturated polyester resin.

The present invention, as currently claimed, is directed to a method for the production of a polyurethane moulded body comprising:

- (a) preparing a mixture of
  - (i) isocyanate and
  - (ii) unsaturated monomers having both reactive double bonds and hydroxyl

groups,

as starting components, wherein the monomers containing hydroxyl groups are used in a stoichiometric ratio or in less than the stoichiometric amount relative to isocyanate; and wherein at least one of the starting components is at least trifunctional and the other one is at least difunctional, with regard to NCO and OH groups, respectively;

- (b) subjecting the mixture to a polyaddition reaction that is not triggered by radicals thereby generating a crosslinked, flexible, radical-polymerisable polyurethane preform having a content of nonextractable, reactive double bonds - as determined by DSC - of at least 0.5 mmole/g;

wherein said preform is free of extractable monomers with reactive double bonds;

wherein the mixture before or during the polyaddition reaction is subjected to a shaping step; and

- (c) stabilizing and curing the shaped polyurethane preform by radical-triggered polymerisation of the reactive double bonds, yielding a cured shaped body having a polyurethane matrix.

Articles of manufacture that are moulded bodies prepared by the process of the invention are also claimed. Compositions of matter are not claimed. It has been acknowledged in the present specification that the polyurethane compositions employed in the practice of the present invention are similar to those described in EP 262488 (see, for example, page 4, lines 19 and 20.) However, as pointed out above, the essential difference between EP 262 488 and the present invention is that the polyurethane material disclosed and claimed in EP 262 488, which is similar to the polyurethane material of the "preform" of the present invention, is used as a filler material in the production of shapeable and curable compositions for making dental devices, whereas the moulded body of the present invention is a shaped and cured molded body having a polyurethane matrix already in its preform, and optionally additives, wherein during final, radical-triggered polymerisation, the reactive double bonds of the polyurethane matrix react with each other, thus stabilizing and curing the shaped structure of the polyurethane matrix preform. Thus, the article of manufacture of the present invention is different from that disclosed in EP 262 488. They are different because the processes employed for producing them are different.

Neither Verleg et al. nor Smith disclose or suggest the currently claimed method of the present invention. In particular, Verleg et al. does not teach preparing a mixture of isocyanate and unsaturated monomers having both reactive double bonds and hydroxyl groups and subjecting the mixture to *a polyaddition reaction that is not triggered by radicals*. Verleg et al. teach mixing ethylenically unsaturated monomer with a vinyl ester compound and a



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polyisocyanate and promoting copolymerization with a free radical catalyst (see column 5, line 58 through column 6, line 15). Smith does not teach preparing a mixture of isocyanate and unsaturated monomers having both reactive double bonds and hydroxyl groups, as starting components, wherein at least one of the starting components is at least trifunctional and the other one is at least difunctional, with regard to NCO and OH groups, respectively; subjecting the mixture to a polyaddition reaction; and subjecting the mixture before or during the polyaddition reaction to a shaping step.

Accordingly, it is requested that the rejection of claims 1-13, 16-18, 20, 22, 25-30, 32-38, and 40-51 under 35 U.S.C. 103(a) as being unpatentable over Verleg et al. or Smith, each in view of EP 262,488, be withdrawn.

In view of the foregoing, it is submitted that this application is now in condition for allowance and an early Office Action to that end is earnestly solicited.

Respectfully submitted,



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